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Small quantum algorithms realized in an ion trap array[1]

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Atomic ions confined in an array of traps represent a potentially scalable approach to quantum computing. All basic requirements have been experimentally demonstrated in one and two qubit experiments. The remaining task is to scale the system to hundreds and later thousands of qubits while minimizing and correcting errors in the system. While this requires extremely challenging technological improvements, no fundamental roadblocks are currently foreseen. I will give a survey of recent progress in implementing simple two and three-qubit quantum algorithms with ions in trap arrays. In particular, implementations of quantum teleportation, quantum error correction and the quantum Fourier transform will be discussed. I will also summarize the prospects and challenges of scaling this particular approach towards a large scale computing device.

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[2]In collaboration with J. Chiaverini, M. D. Barrett, T. Schaetz, J. Britton, R. B. Blakestad, W. M. Itano, J. D. Jost, E. Knill, C. Langer, R. Ozeri, R. Reichle and D. J. Wineland